KENTUCKY ROCK ASPHALT

for

MODERN TENNIS COURTS, PLAYGROUNDS, SIDEWALKS AND RECREATION AREAS

KENTUCKY ROCK ASPHALT INSTITUTE
LOUISVILLE, KENTUCKY
MAY 1939

PREFACE

THIS booklet has been prepared to answer the many requests received from School and Park Boards, municipal and other public officials, as well as individuals interested in recreational work, for proper designs and methods of constructing rock asphalt tennis courts, playgrounds, and sidewalks.

Contained herein are suggestions for treating subgrade and drainage problems; methods of base construction and surface courses; a detailed method of laying out a tennis court; designs and cross sections for tennis courts and playgrounds.

The designs provide for playgrounds which may be converted into basket ball; volley ball; or tennis courts. The tennis courts may also be used for skating rinks, as described in the text.

A special chapter is written on sidewalks which are becoming more necessary in rural communities and city parks because of the higher speeds of automobiles. There is also a chapter on the proper maintenance of a Kentucky Rock Asphalt surface.

The text is illustrated not only with drawings, but also with photographs showing various courts and playgrounds that have been constructed with a Kentucky Rock Asphalt surface.

A booklet entitled "Kentucky Rock Asphalt—Specifications and Designs" gives complete specifications for constructing rock asphalt highway and street pavements. This booklet will also be furnished to interested parties upon request.

KENTUCKY ROCK ASPHALT INSTITUTE,
312 South Fourth Street,
Louisville, Kentucky

KENTUCKY ROCK ASPHALT

The Ideal Surfacing for Tennis Courts, Playgrounds, Sidewalks and Recreational Areas

Battery of 12 Tennis Courts in Grant Park, Chicago, Ill. Kentucky Rock Asphalt Surface on Waterbound Macadam Base. Laid 1931. Michigan Avenue's imposing skyline in the background. There are 200 Kentucky Rock Asphalt Tennis Courts in the Park System of the City of Chicago.

KENTUCKY ROCK ASPHALT INSTITUTE
was formed and is supported by the companies with long standing and experience in the production of Kentucky Rock Asphalt

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CHAPTER I

ADVANTAGES OF KENTUCKY ROCK ASPHALT
on Tennis Courts, Playgrounds and Sidewalks

Kentucky Rock Asphalt is a sandstone impregnated with native bitumen by Nature's own forces. It has endured through the ages in the earth's crust. The sand in Kentucky Rock Asphalt is over 93% silica. The hard, angular silica sand grains, ideally graded by nature, are bonded together with 7% to 9% natural asphalt. For commercial use the bituminous sandstone is crushed and finely pulverized. The pulverized material is spread over the base and rolled. The rolling reestablishes the bond.

While Kentucky Rock Aspalt is principally used as a street and highway surfacing material, it is also extensively used for surfacing playgrounds, tennis courts, walkways, airports, etc. Examples of these may be found in many sections of the country.

Its fine sand grain composition makes its surface smooth, easy on the feet, and yet it provides a non-skid surface. This non-skid characteristic makes it ideal for playgrounds. Its resilient quality prevents much of the fatigue in ankles and arches experienced by players using a rigid type of surface.

It produces a non-glaring surface that is easy on the eyes.

Playgrounds surfaced with rock asphalt require less attention than the clay surfaces, as they require practically no work to keep clean and sanitary and there is no tracking of mud into the school buildings. Hence, children's clothing is easier to launder and requires less changing. A playground or tennis court surfaced with Kentucky Rock Asphalt may be used immediately after a rain.

The rock asphalt court eliminates the necessity for frequent weeding, dragging, rolling and sprinkling very necessary on a clay court. It retains the conventional line markings on the surface for long periods. This, too, is a saving in upkeep cost. Hence, the amount saved in maintenance of a rock asphalt court over a clay court will soon pay for the initial added cost of a rock asphalt surface.

Kentucky Rock Asphalt possesses all the requirements for a first class sidewalk. It is clean and free from dust, durable, firm, but yet resilient enough to be yielding under foot. It can readily be built to a smooth surface and presents a non-glaring, pleasing appearance.

From a safety point of view, this material ranks high. It does not crack or buckle and form obstructions to pedestrians as a more rigid type of material may do. These features together with the fact that it is the most non-skid type of paving material will prevent many accidents now due to falling on slippery surfaces.

Any Kentucky Rock Asphalt surface can easily be repaired with the same material so that the patch will not be conspicuous or even noticed. This is a desirable feature in walks, playgrounds, and tennis courts, in order to preserve their original uniformity in color.

Four Tennis Courts in Juneau Park, Milwaukee, Wis., surfaced with Kentucky Rock Asphalt. Laid 1930. Construction for six additional courts in background. The surface is clean and smooth, and produces a true bound to the ball. It holds the line markings well, is non-skid and produces no glare in the brightest sunshine.

CHAPTER II

DRAINAGE AND SUBGRADE

Subgrade Drainage

The need for subgrade drainage depends upon the nature of subgrade soil. Gravelly or sandy soil will usually furnish sufficient drainage so that subsoil drains will not be necessary.

On clay soils that have no natural drainage and on subgrades located where hillside seepages or spring water prevails, it is desirable that subdrains be installed. It may also be desirable to have subsoil drains to carry the surface water as described under "Surface Drainage".

These same subsoil drains which carry the surface water may be a part of the necessary subdrainage system. Laterals to the main drain that carries the surface water, can be made of French drains or common drain tile. It is desirable to construct the main drain that carries the surface water of vitrified sewer pipe or its equivalent in order to better guarantee against breaking down or clogging, although for isolated courts, common drain tile should be satisfactory.

Where hillside seepage is a source of poor drainage, an intercepting drain between the court and hillside may be constructed like that shown in Figure 1. Where the entire subgrade is poorly drained, lateral drains spaced about 20 ft. may be placed under the entire court, joining with the main subsoil drain as shown in Figure 2. (Subsoil drains properly installed will reduce to some extent the thickness of base required.)

Where courts are built on a fill or elevation above the surrounding terrain, usually no subsoil drainage will be needed except where a battery of courts may require subsoil drains to carry the surface water.

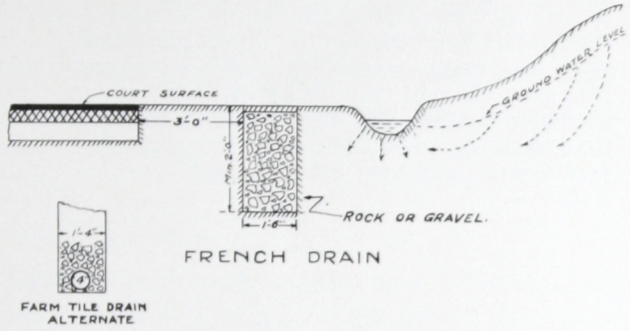

FIGURE 1—Method of Intercepting Hillside Seepage.

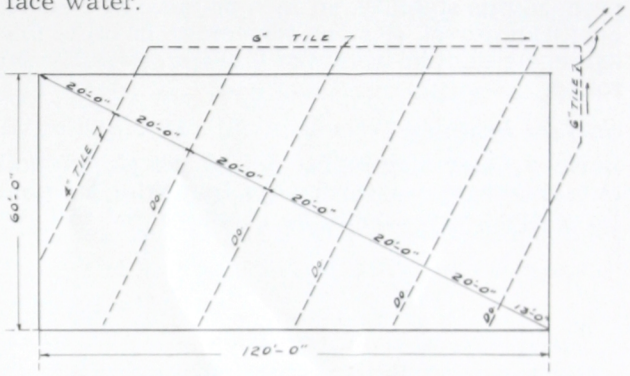

FIGURE 2—Design of Subsoil Drainage System.

Battery of 8 Tennis Courts in Williamsbridge Park, Bronx, New York City. ¾ inch Kentucky Rock Asphalt Surface on a 4 inch course of Limestone Screenings and Emulsified Asphalt on 8 inches of Cinders. Laid 1937.

CHAPTER II

DRAINAGE AND SUBGRADE

Subgrade

After all drainage has been installed and all permanent subgrade structures placed, the area under consideration shall be brought to the proper grade and rolled until thoroughly compacted. Where fills are to be made, the earth shall be placed in level courses not exceeding 4 inches in depth and thoroughly rolled or hand tamped. If this tamping or rolling is not done, the fill shall stand for several months to properly settle. In compacting new fills the use of a reasonable amount of water will hasten settlement.

Emphasis shall be placed upon the uniformity of the subgrade and it shall have sufficient stability to carry the loaded vehicles used to convey the base materials to the project without any noticeable deformation of the surface. If necessary to produce this stability, an inch or more of cinders, bank-run gravel, or stone screenings, or other fine aggregate shall be harrowed into the subgrade and rolled.

Surface Drainage

Surface water may be carried off the playground or tennis court in several ways. In making a design for a court, care should be exercised not to have too much nor too little fall. Too much fall will give an advantage to the player on the high side. Too little fall will retard surface drainage following a rain. This is not only objectionable to the players but the standing water slowly soaks into the surface and foundation and may be very detrimental to both.

Surface Drainage

In Figure 3 are three suggested designs, and in Figure 4, another for surface drainage of tennis courts, which from the player's standpoint, permit good sight distance and give equal advantages to both sides. For single court construction, Design 1, 2, or 3, may be used. For a multiple court construction, Design 2 or 4 may be used. From the construction point of view, the first three designs are equally practical. Design 4 is more difficult to construct. In much of the above discussion for drainage, reference has been made only to tennis courts; however, the same principles apply to playgrounds. Playgrounds will usually permit a greater spacing between surface drainage outlets. It is desirable that these be so located as to remove all the surface water very soon after it falls.

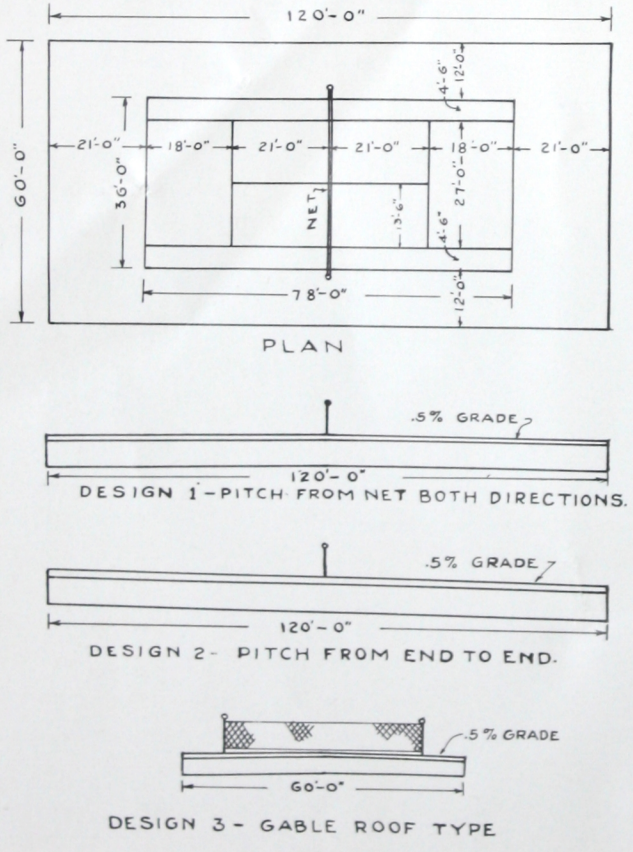

FIGURE 3
Three designs of Surface Drainage for Tennis Courts.

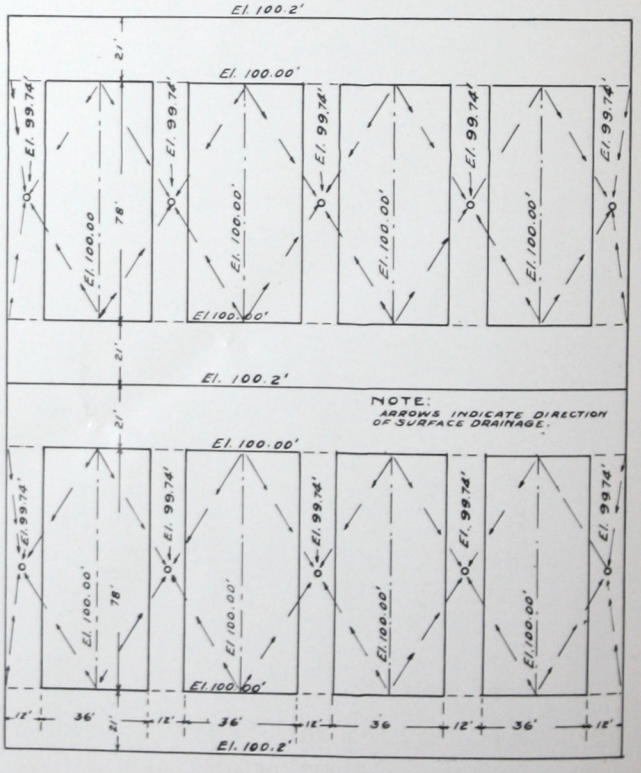

FIGURE 4
Six Courts showing a method of design for Surface Drainage.

CHAPTER III

BASE AND SURFACE COURSES

Design of Cross Section

The design of the cross section shall conform to one described on pages 14 and 15 as may be designated. The courses shall consist of approved material constructed on the subgrade prepared in a manner previously described. These courses shall be constructed in conformity to the lines and grades shown on the plans or as ordered by the Engineer.

Materials

The *aggregates* to be used in the various courses shall be sound and of good quality crushed stone, slag, gravel, and sand, meeting the State Highway Department specifications for road or similar work. Where *cinders and clinkers* are specified, they shall be well graded and of average good quality of these materials.

Coarse Aggregate

Coarse aggregate shall consist of crushed gravel, stone, and slag, and shall range in size from 1 to 2½ inches and shall be uniformly spread without segregating the different sized material. The crusher-run stone shall all pass through a 1½ inch square mesh and have not less than 15% nor more than 25% that will pass through ¼ inch square mesh. Stone screenings shall range in size from ¾ inch down to and including the dust from crusher-run material of such nature that it will well bond the coarser aggregate.

Bank-Run Gravel

Bank-run gravel shall have a maximum size of 1½ inches and include not less than 40% nor more than 80% through the ¼ inch screen. It may not exceed 5% clay when used alone in a course and shall contain 5% to 10% when used in a mixture with cinders and crusher-run stone.

Bituminous Materials

The bituminous materials shall meet State Highway Department specifications for such materials used in similar work in pavements.

Cement Concrete

Where *concrete base* is used, the aggregate and workmanship shall conform to the State Highway Department specifications for Portland cement concrete pavement.

The top or wearing course shall consist of Kentucky Rock Asphalt meeting the specifications for natural or processed sandstone rock asphalt prescribed by the Kentucky Rock Asphalt Institute, which specifications will be furnished on request.

Base Course Construction

The material in the base courses shall be spread to the specified grade in layers of uniform thickness and density and each layer thoroughly compacted by rolling before the next layer is placed thereon. Any places inaccessible to the roller shall be thoroughly hand tamped. After dry rolling the aggregate shall be watered in such amount that continued sprinkling and rolling will produce a maximum density.

Fine Aggregate Course

If the subsoil is clay, an insulation layer of 1½ to 2½ inches of coarse sand, crusher-run stone, stone screenings, cinders, clinkers, or bank-run gravel, (or a mixture of two or more of these materials) as approved by the engineer, shall be spread upon the subgrade. These materials shall be uniformly mixed and spread by the use of a grader, or harrow. A small amount of subsoil may be intimately mixed with the fine aggregate in the harrowing operation, if necessary to aid in compacting it. After spreading to uniform density this fine aggregate course shall be sprinkled lightly and rolled until solid and compacted. If required additional limestone screenings or other suitable fine aggregate shall be spread upon and harrowed into this course and the sprinkling and rolling continued with a sufficient time interval to secure good compaction. If sand is used for this fine aggregate course not more than 2 inches in depth shall be applied. Any additional thickness of the course shall consist of crusher-run stone or any of the other materials mentioned herein, and they shall be so graded and mixed as to produce a solid compact layer when rolled.

CHAPTER III

BASE COURSES

Constructing a bituminous macadam base preparatory to laying the Kentucky Rock Asphalt surface course on a battery of six Tennis Courts in Juneau Park, Milwaukee, Wis.

Coarse Aggregate Courses

Upon the subgrade, or fine aggregate course as previously constructed, the base course material shall be uniformly spread and compacted by rolling. No single layer in the base course shall have a thickness when compacted of more than 4 inches. If crushed stone, slag, or gravel type of base course is constructed, it shall be filled with limestone screenings or other approved bonding material, and rolled and sprinkled until a solid compacted surface is produced in accordance with the specifications of the State Highway Department for waterbound macadam work. Care shall be taken against over-sprinkling that will soften the subgrade.

If a bituminous macadam penetration base is constructed, it shall be done in accordance with the State Highway Department specification for this class of work.

Binder or Intermediate Course

When specified, a binder course on which to lay the Kentucky Rock Asphalt surface shall be constructed on the base. This binder course shall consist of a penetration macadam, standard hot-mix binder, any of the acceptable designs of cold-mix plant binders, or cold-mix binder as prepared locally in concrete mixer of ample capacity. The coarse aggregate to be used in this last described mixture shall conform to standard specifications with a gradation between ½ inch and 1½ inches, depending on thickness of course. The bituminous material to be used in this mixture shall be a standard product, liquid asphalt, cutback asphalt, coal tar, or asphalt emulsion. In the construction of all these binder courses, the material shall be uniformly spread and well compacted by rolling when it is in the right curing stage to best solidify under the roller. (During extremely hot weather, it may be necessary to delay the completion of the rolling for some hours, or even days, after the bituminous course is laid in order that the right degree of stiffness will have developed in the mix to aid its compaction. During cold weather the rolling shall be done soon after the material is laid and before the bituminous mixture becomes hard and brittle.) All binders containing an appreciable amount of volatile matter shall be permitted to cure, as directed by the Engineer, before spreading the rock asphalt thereon.

Concrete Base

For a Portland cement concrete base it is recommended to use a 1:3:6 mix, of properly graded clean gravel, stone, slag or cinders, for the coarse aggregate. The fine aggregate shall be clean sand, stone screenings or a combination of both. The Portland cement concrete shall be in accordance with standard specifications for this class of work.

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KENTUCKY ROCK ASPHALT SURFACE COURSE

Paint Coat. If no binder course is used, the base shall be given a paint coat of liquid asphalt, emulsion or cut back of 0.1 to 0.2 gallons per square yard to bond the rock asphalt to it. This paint coat shall be sufficient to coat the surface of the base but leave no pools of asphalt thereon.

Rock Asphalt. Upon the binder course, or the base course, where no binder course is specified and when dry and the asphalt in the binder or paint coat is tacky, the rock asphalt shall be uniformly spread by hand in the specified amount.

Spreading Rock Asphalt. As a guide in spreading the rock asphalt to a uniform surface and the proper thickness, metal gauge strips shall be laid on the surface to be covered, spaced not more than 3 feet apart. The height of the strips shall be such as to secure the specified amount of rock asphalt. (The rock asphalt will compact about one-third its loose depth.) The metal gauge strips shall be 14 to 18 feet long and preferably made of 3/16 or ¼ inch thick steel.

When brought on the work the rock asphalt shall be deposited on dumping boards or on an area ahead of the space on which it is to be spread. From there it shall be shoveled to its position on the base in such manner as to produce a uniformly dense layer. All lumps shall be broken and the material raked to its full depth with suitable asphalt rakes until it is thoroughly and uniformly loosened and the surface is level and to the proper cross section. All rock asphalt shall be shoveled and no material shall be raked into place from the piles. After raking, the loose asphalt shall be brought to the elevation of the top of the gauge strips by the use of lutes pulled longitudinally on the gauge strips. A uniformly dense and even surface texture shall be produced without honeycombed areas. The surface shall be reraked and reluted, if necessary, to produce this condition. The luting and raking shall be carried on immediately behind the shovelers as a continuous operation with the spreading. After the rock asphalt is spread and leveled as described above, the gauge strips shall be pulled forward a distance not to exceed 6 feet and the spreading and leveling operations continued.

After the gauge strips are pulled forward, the loose rock asphalt surface shall be cross floated with a long-handled heavy float in such a way as to eliminate all irregularities and grooves left by the metal strips. Such additional rock asphalt, free from lumps, shall be cast over the surface during the cross floating as may be necessary to produce a level surface. At no time shall the workmen be allowed to walk on the rock asphalt *before it is raked, luted and rolled.*

During cool weather, rock asphalt can be more easily unloaded from railroad cars and spread if it is warmed by injecting just sufficient dry steam into it to make it workable. See design for small steaming equipment on page 21. Complete drawing of larger steaming equipment will be furnished on request.

Rolling. After the rock asphalt is properly spread as described above, it shall be well compacted by rolling when dry, with a self propelled roller weighing not less than 5 tons. It shall be rolled several times, preferably on different days if the weather is warm. The last rolling shall be done when the rock asphalt is at such temperature that the wheel marks left from the previous rolling will be eliminated and no appreciable marks left. *The roller shall not be turned sharply so as to distort the surface.* If the rock asphalt is laid directly upon a concrete or other rigid base, it shall be rolled but once. In the rolling operation the roller should lap ½ the area of the previous trip.

Applying paint coat preparatory to spreading rock asphalt.

Spreading the rock asphalt by hand methods.

CHAPTER IV

DESIGNS FOR TENNIS COURTS AND PLAYGROUNDS

The design of tennis courts and playgrounds is not complicated yet certain standards must be complied with to make them satisfactory.

Playgrounds. Since the playground will have to accommodate itself to the size, shape, and location of the available space, each one will be a special problem for individual study. It is important that it be constructed with sufficient slope for proper drainage. A desirable slope is 0.5%, although from 0.5% to 1.0% (or 6 to 12 inch fall per 100 lineal ft.) is satisfactory. While as large as 3% slopes are sometimes used, so large a slope is not desirable where games are to be played. If the playground is to be used as a tennis court, that portion should conform in slope to one of the designs shown in Figure 3 or 4, page 6.

Laying out a Tennis Court. In Figure 5 is shown all dimensions of a Doubles Court (used by four players) which is a rectangle 36 ft. wide by 78 ft. long. A Singles Court (used by only two players) is 27 ft. wide by 78 ft. long. This design is shown in Figure 5 without the two outer side lines.

Having decided upon the position of the net, set 2 stakes 27 ft. apart, N and T, in Figure 5, which establishes the net line. At each end of the court, parallel with the net line and 39 ft. from it, are drawn the base lines AB and CD, the ends of which are connected by the side lines AC and BD. On each side of the net, at a distance of 21 ft. from it, and parallel with it, are drawn the service lines EF and GH. Halfway between the side lines and parallel with them is drawn the center line RS, dividing the space on each side of the net into two equal parts, the right and left courts.

If a transit is not available, the easiest way to lay out a Doubles Court is to lay out a Singles Court and then add the extra lines to complete the Doubles Court, as follows: After deciding upon the position of the net, set two stakes N and T, 27 ft. apart in Figure 5. Attach to these stakes the ends

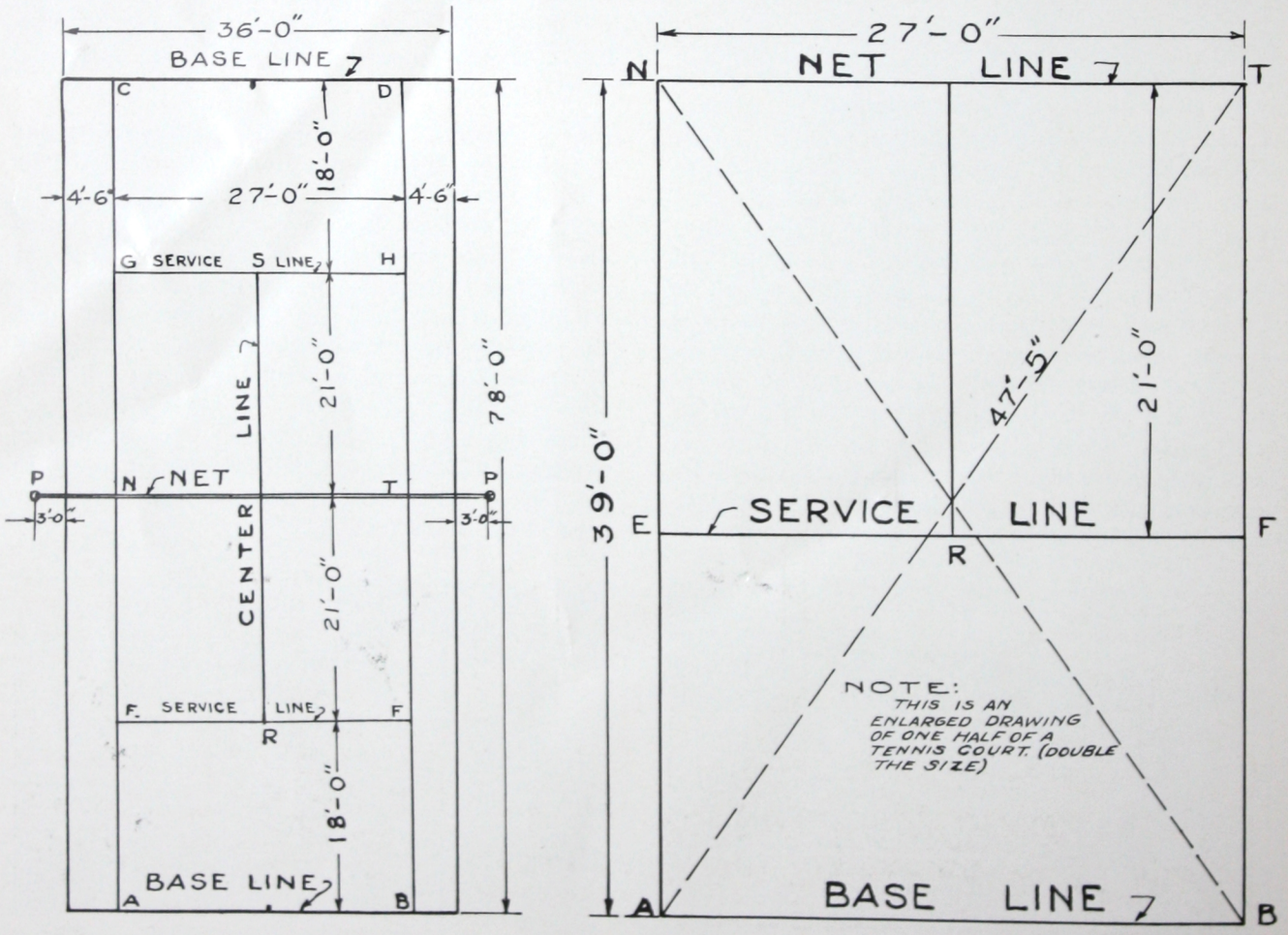

FIGURE 5

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DESIGNS FOR TENNIS COURTS AND PLAYGROUNDS

of two measuring tapes; TA, 47 feet, 5 inches long and NA, 39 ft. long. Draw both taut until they meet at point A. This will give one corner of the court. At point E, 21 ft. from N, put in a stake to mark one end of the service line. By interchanging the measures and repeating the process the other corner B and other end of service line F are located.

The same process on the other side of the net line will complete the outside boundaries of the Singles Court. By connecting the middle points R and S of the service lines, the center line will be made. By extending the two base lines 4 ft. 6 inches each way and connecting the four new points, the boundaries of the Doubles Court will be completed.

The Back Stops are constructed 21 ft. behind and parallel to the base lines, the full width of the Doubles Court, or 36 ft. From each end at an angle of 45 degrees to the base line, the back stops are extended 10 to 20 ft. The back stops should be 10 to 12 ft. high, of 2 inch mesh if made of heavy hard wire; or 1½ inch mesh if light, soft wire is used.

Width of Lines. The center and service lines are made 2 inches wide; base lines, 4 inches wide; all other lines, 1 to 2 inches wide.

White Paint for Lining Purposes. It is very desirable that the court markings on the asphalt surface be made with a good white paint. The following formula for a white paint is very satisfactory:

Mix dry one-half (½) pound of pulverized glue and one-half (½) pound of whiting. To this add two (2) pounds of common salt and mix thoroughly.

Heat to 212°F. four (4) gallons of water to which has been added four (4) teaspoons of bluing. Add this solution slowly to the above mixture and stir until thoroughly dissolved. To five (5) pounds of unslaked lime add enough of the above solution slowly until the lime is thoroughly slaked. Allow this to cool. To the remainder of the solution add this five (5) pounds of slaked lime and stir until thoroughly blended.

This solution may then be thinned to any consistency by adding water.

Any standard Highway Department specifications for road marking should be a good guide in the selection of paint for this purpose.

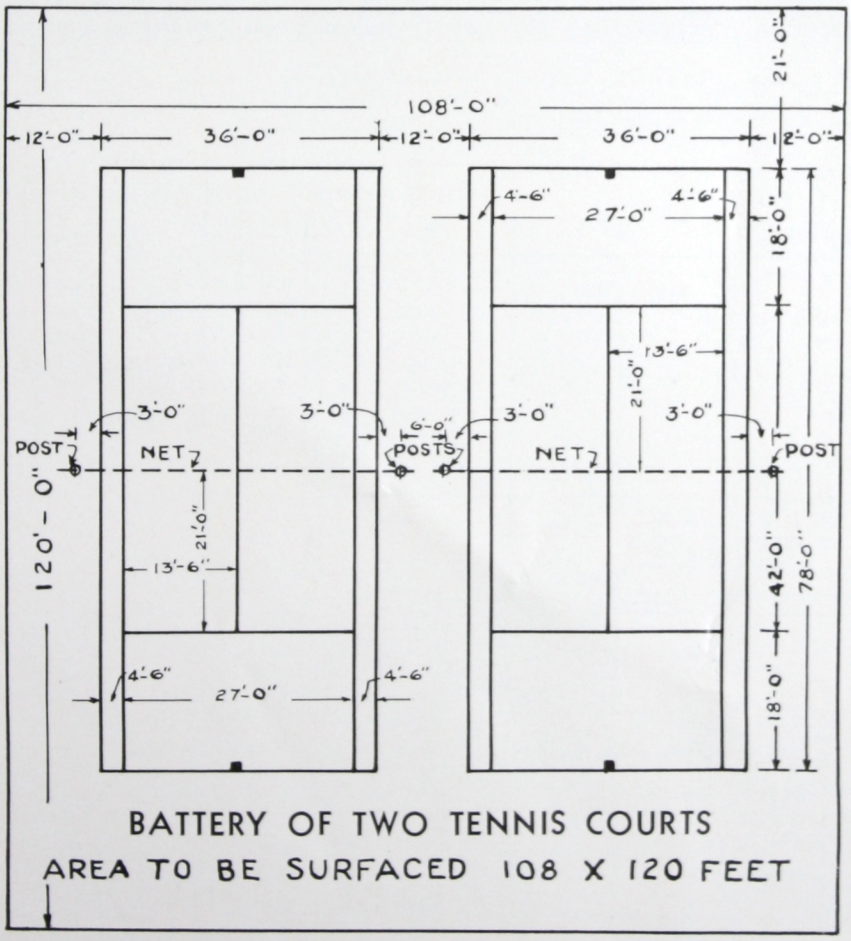


FIGURE 6

Battery of Tennis Courts

Where a battery of tennis courts is constructed, it is necessary that proper spacing of same be made. Not only must sufficient leeway be provided at the ends of a court but also sufficient room left between the side of the courts so that there will be no interference with players or hazard introduced. In Figure 6 is shown a battery of two courts with a spacing of 12 ft. between the outer side lines. This is the minimum spacing that should be allowed, although where space is important this distance is sometimes reduced. If plenty of space is available, it is better that this distance be as much as 24 ft.

CHAPTER IV

CONVERTIBLE PLAYGROUNDS

Figure 7 shows a playground which may be converted into a tennis court or basket ball court, the latter shown by dotted lines; also a tennis court converted into a volley ball court, the latter shown by dotted lines.

Tennis Court or Playground as Skating Rink

For ice skating This is accomplished by placing a small ridge of saturated clay earth about one foot high around the border of the area to be flooded. This earth should be tamped and compacted and permitted to freeze so that it will be water-resistant before the area inside is flooded. The shallow reservoir thus created is flooded until the ice is frozen several inches thick. When the ice thaws the earth embankment is removed, allowing the water to drain from the court. All skating should be stopped when the ice becomes soft which would permit the skates to cut through it and damage the court surface. The court or playground should not be used after it is drained until the surface is well dried. Also it is desirable to flood a court only after it has been constructed a year and been played on at least one season so that its surface will be well compacted. It will, of course, be practical to so utilize the courts or playgrounds as ice skating rinks only in northern climates where frequent winter thaws are not common.

For use as a roller skating or roller hockey rink, these rock asphalt courts and playgrounds need no particular preparation.

Where a tennis court is to be converted into another form of playground, it is necessary that the posts be removable. This is usually accomplished by setting 2½ inch pipes, 2 or 2½ ft. in the ground, preferably in concrete, flush with the surface. The up-right posts are set into these and can be taken down at will. When the stakes are removed, the ground pipes are plugged or capped.

Roller Skating Hockey on Kentucky Rock Asphalt wearing surface, Williamsbridge Park, Bronx, N. Y.

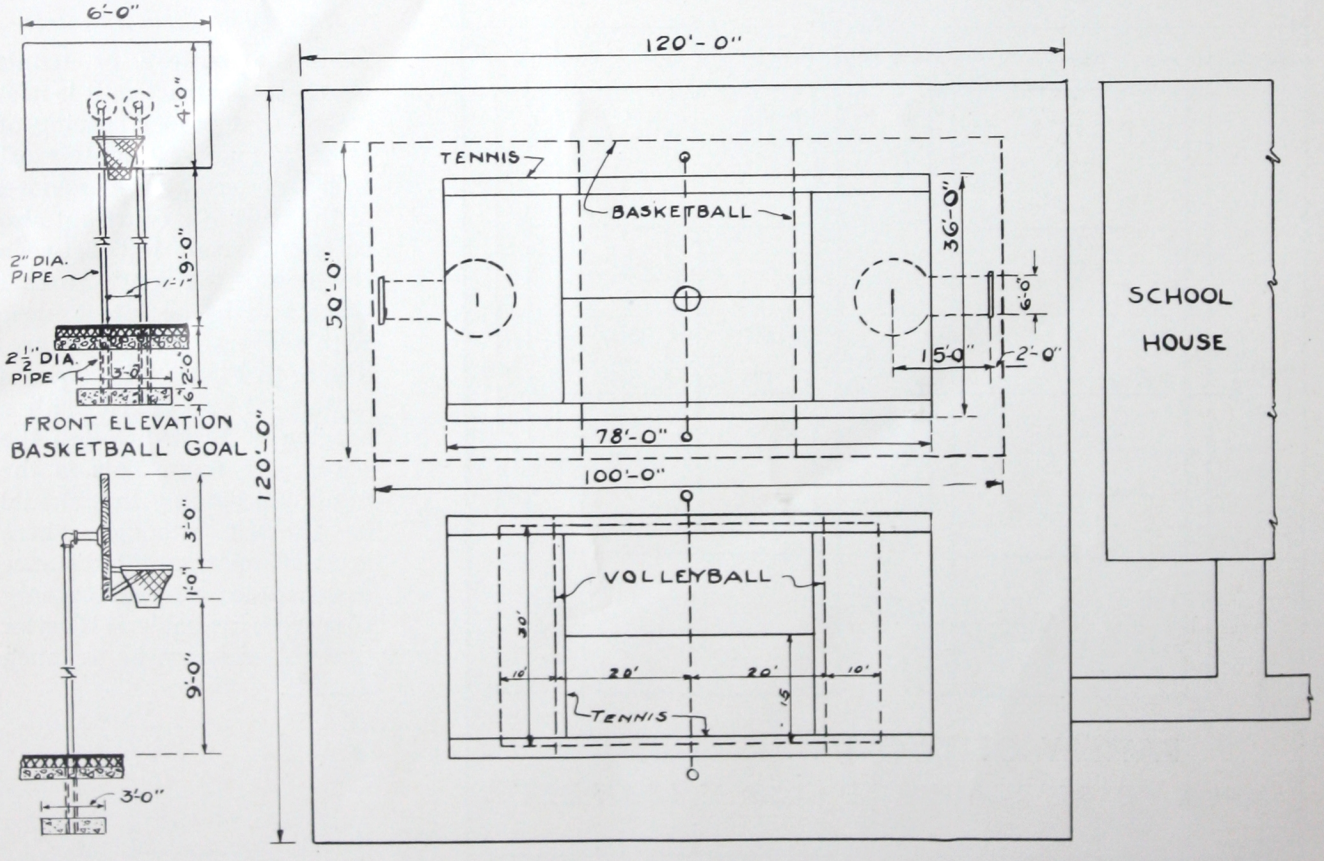
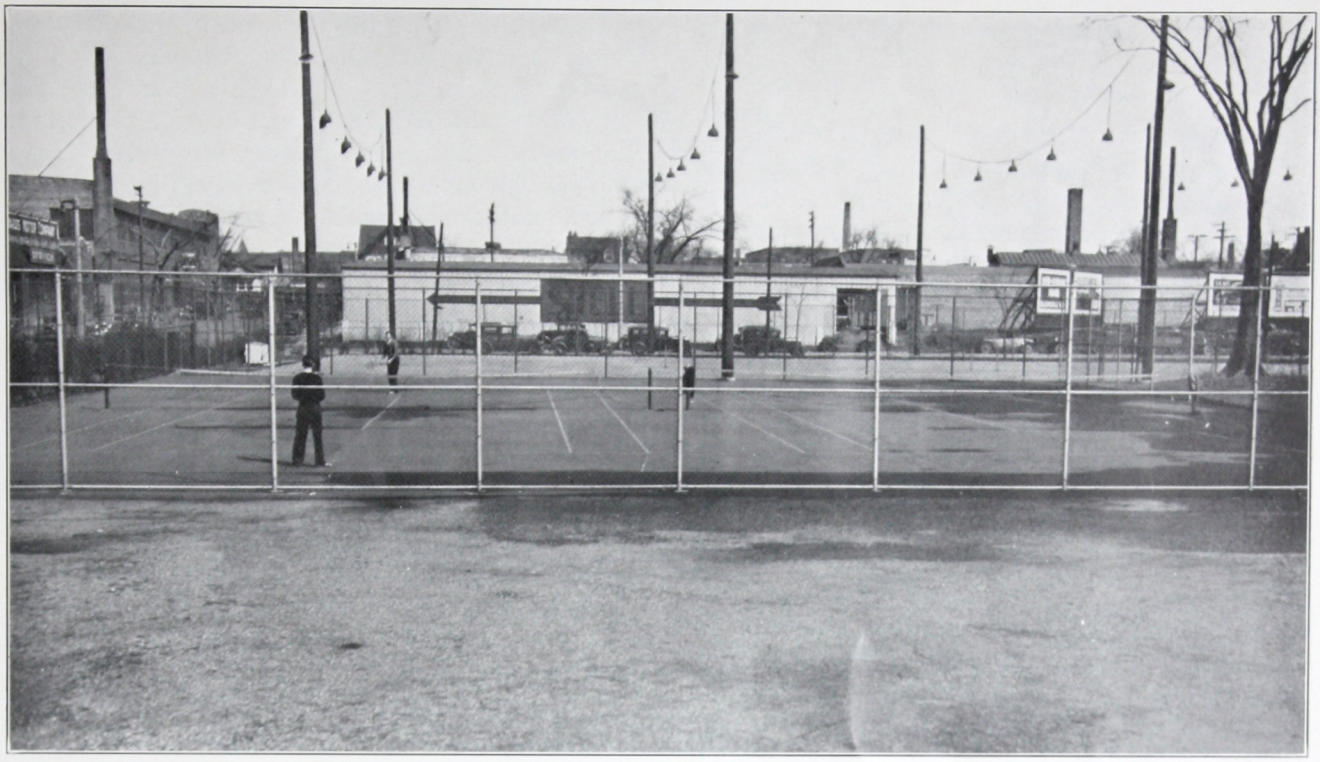


FIGURE 7

CHAPTER IV

LIGHTING METHODS FOR PLAYGROUNDS



Showing method of lighting used on this Battery of Two Tennis Courts in Merrill Park Playground, Milwaukee, Wis. 1-inch Kentucky Rock Asphalt Surface on old Macadam Base as shown in foreground. Laid 1934.

Lighting Methods for Night Activities

Frequently it is desirable for night activities to have a court or playground lighted. If night activities are attempted the lighting should be done properly. Figure 8 illustrates a method of lighting one court. Five lights equally spaced with a minimum candle power of 1,000 are suspended from a cable between the tops of two poles not less than 30 feet high, set at either end of the court. Side lights may be desirable where a battery of courts or a playground is to be lighted. A utility engineer versed in lighting should be consulted in this work.

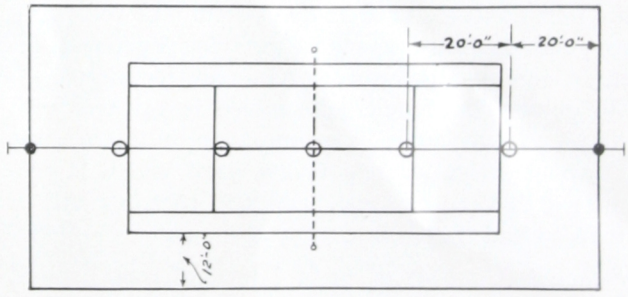
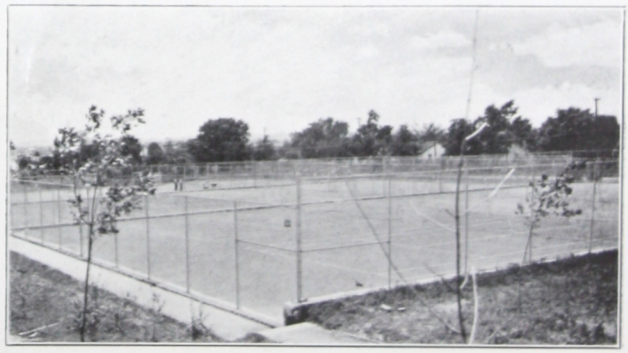


FIGURE 8
Lighting Layout for a Tennis Court.

Battery of Kentucky Rock Asphalt Tennis Courts in Forest Park, New York City, Laid 1936.



Battery of Kentucky Rock Asphalt Tennis Courts at Western State Teachers College, Bowling Green, Ky. Laid 1934.

CHAPTER IV

CROSS SECTIONS FOR VARIOUS DESIGNS

On the following page are shown various cross sections that may be used for tennis courts, playgrounds, and sidewalks.

The design of cross section will be governed by the nature of the soil foundation and availability of local aggregates (stone, gravel, slag, etc.) Stability and a suitable condition for the wearing surface to adhere to, is the prime requisite for the base. While specific thicknesses of base courses are given, these may be reduced on a stable, gravelly, well drained soil. They may have to be increased in thickness for stability on very unstable soils with poor drainage. The following comments are made on the various cross sections.

Section 1—Consists of 1 inch rock asphalt on a 6 inch waterbound macadam base built in two courses. After the top course is dry the excess loose screenings, dust, dirt, and caked screenings are scraped and swept off the surface, a paint coat of liquid asphalt, cutback, or emulsion, is applied in such quantity as to just thoroughly coat all the surface stone. This amount will usually be from .10 to .20 gallons per square yard. The rock asphalt is spread just as soon as the paint coat becomes tacky and before it is dry and brittle.

Section 2—Consists of 1 inch of rock asphalt laid on a 4 inch concrete base made of 1:3:6 mix according to good standard specifications for Portland cement concrete pavement. After the concrete has sufficiently hardened, its surface is painted with liquid asphalt, cutback, or emulsion, in the amount of about .10 gallon per square yard which is permitted to become tacky and the rock asphalt is then spread thereon.

Section 3—Consists of ¾ to 1 inch of rock asphalt laid on a 4 inch bituminous (penetration) macadam base after a fine aggregate course has been constructed 1½ to 4 inches in depth on the clay subgrade. Such a fine aggregate course may be used under any of the other sections when poor drainage or subsoil conditions require it. This thinner rock asphalt top is made possible by the use of a well compacted bituminous course. The better the construction of this course the thinner the rock asphalt top may be.

Section 4—Consists of ¾ to 1 inch of rock asphalt laid on a 1 to 1½ inch binder course which is constructed on a 3 inch waterbound macadam.

Section 5—Consists of a ¾ to 1 inch rock asphalt top on a 1 to 1½ inch bituminous concrete binder laid on a 4 to 5 inch well rolled sandstone base. If necessary to secure proper bond in the sandstone base, limestone screenings shall be applied and the surface sprinkled as the rolling is done. The sandstone may be rolled in one 5 inch course. If limestone is not available, as a substitute the rolled sandstone may be given a treatment of liquid asphalt, cutback, or emulsion, in the amount of 0.3 to 0.5 gallons per square yard, applied in two applications if necessary.

Section 6—Bureau of Parks, New York City Specifications. Consists of ¾ inch of rock asphalt laid on 3 inches compacted (4″ loose) mixture of limestone screenings (100% passing ½ inch screen) and stabilized with an emulsified asphalt. The limestone screenings and emulsion are premixed on the job in a concrete mixer. Sufficient water is added to make the mix the proper consistency. Sixteen (16) gallons of emulsion are used to 1 cubic yard of aggregate. After the course has reached its initial set it shall be thoroughly rolled before the rock asphalt is laid thereon.

Section 7—Consists of 1 inch of rock asphalt on a 3 to 4 inch waterbound macadam that has been given a paint coat. The macadam is constructed on a fine aggregate course 1½ to 2½ inches thick, constructed on the subgrade as described in Chapter III.

Section 8—Consists of 1 inch rock asphalt on a 1½ inch layer of ¾ to 1½ inch size stone, slag, or crushed gravel constructed on a 4 inch course of stabilized soil. The 1½ inch aggregate course is rolled into the stabilized soil before it is fully hardened or if dry and hard, it is softened by sprinkling, allowing sufficient time to permit the aggregate to set in the base. A paint coat of liquid asphalt, cutback, or emulsion, is applied to the aggregate before the rock asphalt is spread thereon. If Florida limerock base is used, as an alternate to the above 1½ inch layer of stone, the limerock shall be given a prime coat treatment of light tar or slow curing asphalt oil. After this dries there shall be applied an emulsified asphalt surface treatment with aggregate covering which shall be well rolled and allowed to cure before the rock asphalt is spread thereon.

Any course shall be given sufficient time to set and harden before the next course is placed thereon. This time will vary with the nature of the material being used and air temperatures.

While the cross sections on the following page show specific thicknesses of base courses, these should be varied not only according to subsoil conditions but also according to climatic conditions.

CHAPTER IV

DESIGN OF CROSS SECTIONS

SECTION—1

1″ Rock Asphalt
Paint Coat
6″ Waterbound Macadam built in two 3″ courses

SECTION—2

1″ Rock Asphalt
Paint Coat
4″ Concrete Base (1:3:6 Mix)

SECTION—3

¾″ to 1″ Rock Asphalt
4″ Bituminous Macadam
1½″ to 4″ Fine Aggregate Course

SECTION—4

¾″ to 1″ Rock Asphalt
1″ to 1½″ Binder Course
3″ Waterbound Macadam

SECTION—5

¾″ to 1″ Rock Asphalt
1″ to 1½″ Binder Course
4″ to 5″ Sandstone Base

SECTION—6

¾″ Rock Asphalt
3″ Plant Mix or Local Mix Binder of
Limestone Screenings and Emulsified Asphalt
(16 Gals. per Cu. Yd. of Mix)

SECTION—7

1″ Rock Asphalt
Paint Coat
3″ to 4″ Waterbound Macadam
1½″ to 2½″ Fine Aggregate

SECTION—8

1″ Rock Asphalt
Paint Coat
1½″ of ¾″ to 1½″ size Aggregate rolled into
the base of 4″ Stabilized soil or Florida Limerock

CHAPTER V

SIDEWALKS

Purpose of Walk

Due to its pleasing appearance and long life Kentucky Rock Asphalt walks have been used in parks in many States. In addition, sidewalks in recent years have become important for pedestrian travel along highways and streets in the interest of safety. A sidewalk should be so constructed as to be pleasant to walk on. It should be free from large pebbles, smooth, and yet not slippery. Hence, the greatest care should be used in its construction. A makeshift sidewalk in rural communities which is so poorly constructed that the pedestrians walk on the road pavement rather than the sidewalk is of little value. A fine sandgrain bituminous mixture that is non-skid and non-glaring, such as provided by Kentucky Rock Asphalt, makes one of the best surfaces for walks.

Design—Sidewalks may have the same cross section as used on playgrounds and tennis courts shown on page 15, the construction of which is described in Chapter III. At driveways, however, the base should be constructed of greater depth so as to be sufficiently strong to prevent breaking down under the heavy wheel traffic. Where the walk does not contact a curb or other fixed structure, it is best to construct the base slightly wider than the top.

Crown—Walks should be sloped for drainage. The usual cross slope is ¼ to ⅜ inch per foot. Topography will determine the direction of the cross slope. Where the walk has a longitudinal slope of more than three feet fall per hundred feet, the cross slope should not exceed ¼ inch per foot. The cross slope may be in one direction or in two directions, depending on whether the surface drainage is carried away on both sides of the walk or whether only on one side as is provided by the pavement gutter.

Local Materials for Base—Inexpensive materials usually can be found locally to make the base of sidewalks. Stone screenings or bank-run gravel with 4% to 7% clay in it, intimately mixed with cinders, make a suitable base course when well compacted by sprinkling and rolling. A 2-inch compacted layer of ¾-inch to 1½-inch size crushed stone rolled into the top of such a mixture and treated with liquid asphalt makes an excellent base on which to spread a layer of Kentucky Rock Asphalt as the wearing surface. Any of the bases shown on page 15 and constructed according to Chapters III and IV should be suitable.

Spreading Kentucky Rock Asphalt—The Rock Asphalt top is spread by hand rakes as described on page 9. The number of gauge strips will be few on narrow walks. Sometimes it is attempted to spread the top course from the edge boards the full width of the walk. However, this is not always practical. Furthermore, a center crown on walks draining in both directions requires at least one metal gauge strip in the center of the walk.

Rolling—While the use of a 3-wheel self-propelled roller to compact the base is desirable, this is not practical on narrow walks. Hence, a small tandem roller may have to be used. With a light roller it is more important that the base be rolled in comparatively thin courses.

If proper compaction cannot be satisfactorily secured with the roller, a time interval with sprinkling or rain will aid in securing a stable base.

Where earth fills are to be made on which to construct the walk, the fill should be rolled in uniform layers not exceeding 4 inches in depth. It is best to construct the earth fill to the finished grade of the walk and then excavate for the base material.

Sidewalk in Hot Springs, Va., surfaced with Kentucky Rock Asphalt.

CHAPTER V

RESURFACING OLD WALKS

If the line and grade are satisfactory, many old walks can be resurfaced to good advantage. Frequently they have become rough from age and use but are stable. Such walks are economical to resurface and thus preserve the value in the old walk. This resurfacing may cost only a fractional part of the cost of tearing out the walk and building a new one which may be no more permanent than the old one resurfaced.

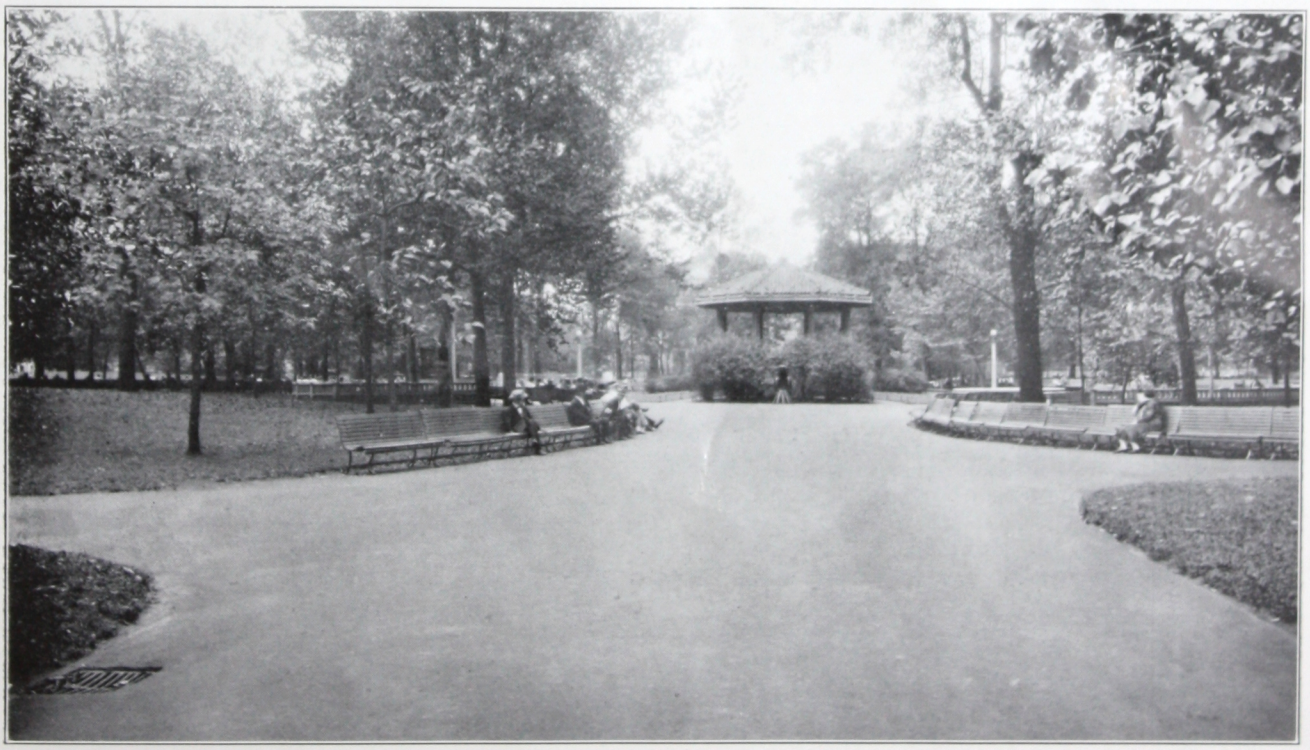
In reclaiming and resurfacing old walks much the same principles apply as in constructing new ones; namely, the securing of a solid, stable base on which to construct a smooth, non-slippery and non-glaring top. Hence, the first requisite is to secure this stable base. All cracks and breaks in the old walk should be dug out to solid base or down to 1 inch below the depth of the remaining base that is being left in place. Such excavations should be tamped full of bituminous-coated stone or a coarse binder mix, or a dry mixture of 1:3:6 Portland cement concrete.

Where the old walk shows signs of disintegration from expansion it will be best to cut out a strip about 6 inches wide across the walk and fill it with binder mixture well tamped in place.

After this repair work is done, a binder course 1 to 2 inches deep should be constructed over the whole area. The thickness of this course will vary to fit the requirements of the old walk. It need be only sufficient to provide the required strength and rigidity of base and to secure the necessary leveling. On top of this binder course is constructed the ½ to ¾ inch Kentucky Rock Asphalt top previously described.

After being properly patched, some old walks will be ready for the Kentucky Rock Asphalt top without the expense of constructing a binder course. On others it may be desirable to increase slightly the thickness of the Kentucky Rock Asphalt top instead of constructing a binder course. The condition of each walk will have to govern this.

Frequently walks have failed because of lack of drainage, creating pools of water which soak into the surface, base and subgrade; freezing and thawing gradually causing disintegration. For this reason water should not be permitted to stand in depressions on a walk. Depressions should be drained, or eliminated by the cheap and easy method of patching as described in Chapter VI. The maintenance and repair of sidewalks and resurfacing of old walks deserves a great deal more attention than it has received. In practically every locality such existing walks present opportunities for civic improvement at small cost.



Kentucky Rock Asphalt Walks in Washington Park, Cincinnati, Ohio.
1 inch Kentucky Rock Asphalt on Penetration Macadam. Laid 1928.

CHAPTER VI

MAINTENANCE AND REPAIR of Kentucky Rock Asphalt Surfaces

A Kentucky Rock Asphalt surface is easy to repair with rock asphalt so that the repaired portions will be inconspicuous and the whole surface remain uniform in appearance.

Such repairs which are minor in character can be made at a very nominal cost with a few simple tools such as rake, shovel, hand tamper, brush for paint-coating, suitable container for liquid asphalt and a small amount of rock asphalt.

The rock asphalt for repairs may be a small amount left from the original construction or new material brought in when additional work is being done in the city. Where no material is available from these sources it may be secured in 200-pound bags shipped direct from the plant.

The rock asphalt spread out in the sunshine for a few hours during hot summer days usually will be sufficiently soft and pliable to readily spread on the areas to be repaired. If it is not sufficiently workable from the heat of the sun, then a small amount may be warmed by spreading it on a steel plate raised off the ground 6 to 10 inches by bricks or stones and a small fire built underneath. The rock asphalt while heating should be moved constantly on the plate with shovel or rake to prevent burning. After it is soft and pliable it can be raked to one side of the plate away from the extremely hot portion where it will remain soft and workable for several hours. It may be heated in a suitable commercial heater which is now made for this purpose.

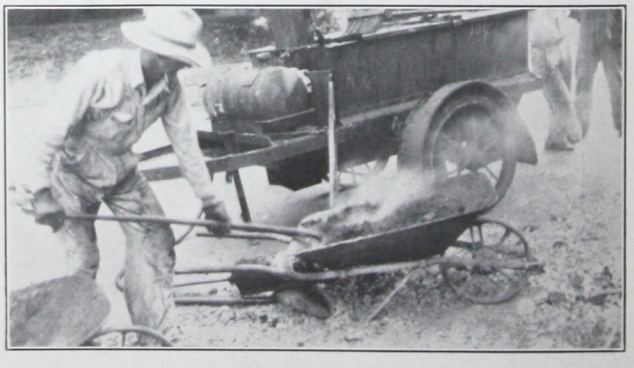
The depression or surface to be patched should first be lightly painted with a liquid asphalt, cutback, or emulsion. For applying this paint coat a hand-brush may be used on small areas. As the areas to be painted become larger, the application is best made by brooming or spraying.

After the paint coat of liquid asphalt has dried until it is tacky, the warmed rock asphalt is spread over the surface and tamped or rolled in place so that it is smooth, uniform and level with the adjacent surface. The above method is used in making skin or surface patches.

If the old surface shows a base failure it will usually be desirable to remove the old material to a depth several inches below the bottom of the surrounding base. This excavated area shall then be tamped full of asphalt coated stone or good binder material that is just sufficiently stiff and tacky to make the well tamped mixture hard and solid. The coated stone should be tamped in layers not over 2 inches in thickness. The rock asphalt top is then spread, leveled and tamped or rolled as the finished surface leaving same slightly higher than the surrounding pavement for future settlement.

If a tennis court or playground has become uneven and it is desirable to resurface a large area, it is best to do so as specified for a new rock asphalt surface as described in Chapter II. This resurfacing should consist of 30 to 100 lbs. of rock asphalt per square yard, depending on the condition of the old surface.

Kentucky Rock Asphalt Heater attached to truck. Cold material is shoveled in front and gradually worked to the rear end of the Heater, thence to the road.



Warming Kentucky Rock Asphalt in a metal wheelbarrow against which is directed the flame of an oil burner.

CHAPTER VI

MAINTENANCE AND REPAIR of Kentucky Rock Asphalt Surfaces

Spreading the warmed rock asphalt on the painted surface.

Tamping the rock asphalt.

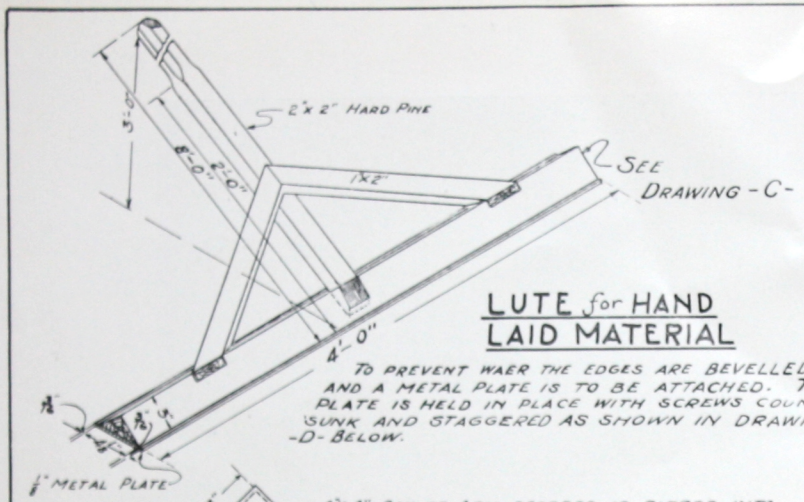
Breaks and cracks in sidewalks can readily be patched with rock asphalt so as to keep their surface smooth and uniform. The edges of the cracks and crevices in the walk to be patched should be first painted with the liquid asphalt. If the patches are very small this paint coat can be applied with a small paint brush.

By the above methods of repairing small breaks, depressions, and cracks, a Kentucky Rock Asphalt surface, whether it be a playground, tennis court, sidewalk, or even the highway, can be maintained smooth and kept in good condition at negligible cost.

It is only necessary that the caretaker be taught a few fundamental principles in doing this work and that he take the simple precautions required to make the work not only easy but low in cost. The skill and efforts of the man in charge of such surfaces will soon be displayed by the condition in which he keeps the surface. Due to the fact that only small amounts of material are needed in ordinary repair work and the tools and equipment for making minor repairs are simple and easy to make or secure, there is little excuse for neglecting this work. Repairs should therefore be made as needed and not allowed to accumulate until the neglected surface is unsightly and the base damaged so badly that major repairs are necessary.

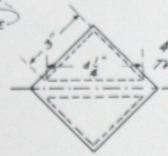
A well maintained surface is the pride of a good caretaker and invariably reflects his intelligence and interest in his work.

Battery of Tennis Courts, Floodlighted, Garvin Park, Evansville, Ind.
Kentucky Rock Asphalt Surface on Waterbound Macadam. Laid 1927.



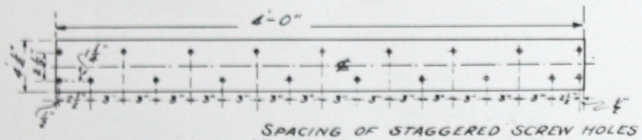
LUTE for HAND LAID MATERIAL

TO PREVENT WAER THE EDGES ARE BEVELLED AND A METAL PLATE IS TO BE ATTACHED. THE PLATE IS HELD IN PLACE WITH SCREWS COUNTER SUNK AND STAGGERED AS SHOWN IN DRAWING -D- BELOW.



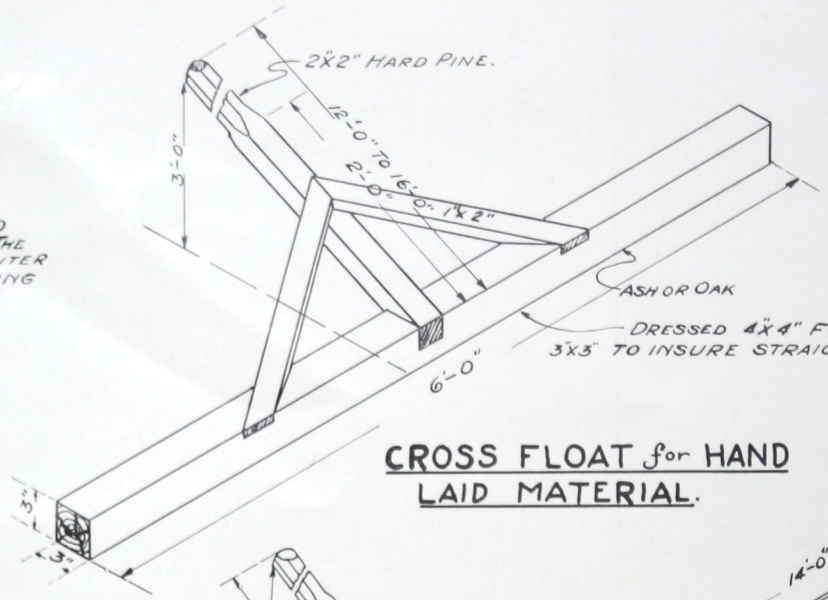
4"X4" OAK OR ASH DRESSED IS RIPPED INTO TWO PARTS EACH TO BE MACHINE PLANED TO DIMENSIONS SHOWN BY DOTTED LINES

DRAWING -C-

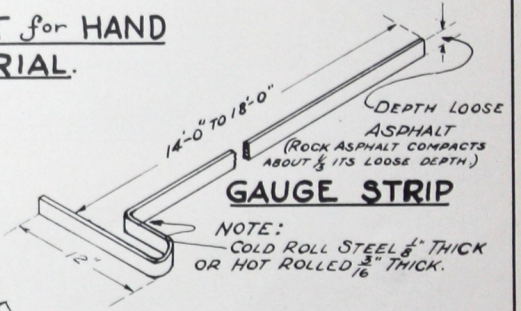


SPACING OF STAGGERED SCREW HOLES
HOLES TO BE COUNTER SUNK.

DRAWING -D- of METAL PLATE.

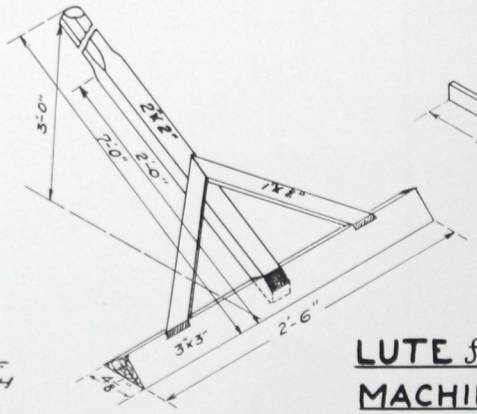


CROSS FLOAT for HAND LAID MATERIAL.



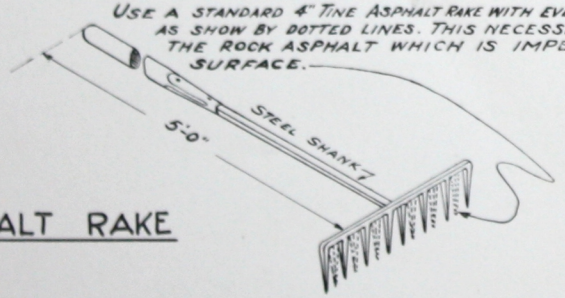
GAUGE STRIP

NOTE:
COLD ROLL STEEL 1/8" THICK OR HOT ROLLED 3/16" THICK.

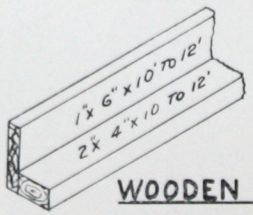


LUTE for CORRECTING MACHINE LAID MATERIAL

USE A STANDARD 4" TINE ASPHALT RAKE WITH EVERY OTHER TINE REMOVED AS SHOW BY DOTTED LINES. THIS NECESSARY FOR EQUAL DENSITY OF THE ROCK ASPHALT WHICH IS IMPERATIVE FOR A SMOOTH SURFACE.



ASPHALT RAKE



WOODEN SIDE FORM

DESIGN OF

SMALL TOOLS

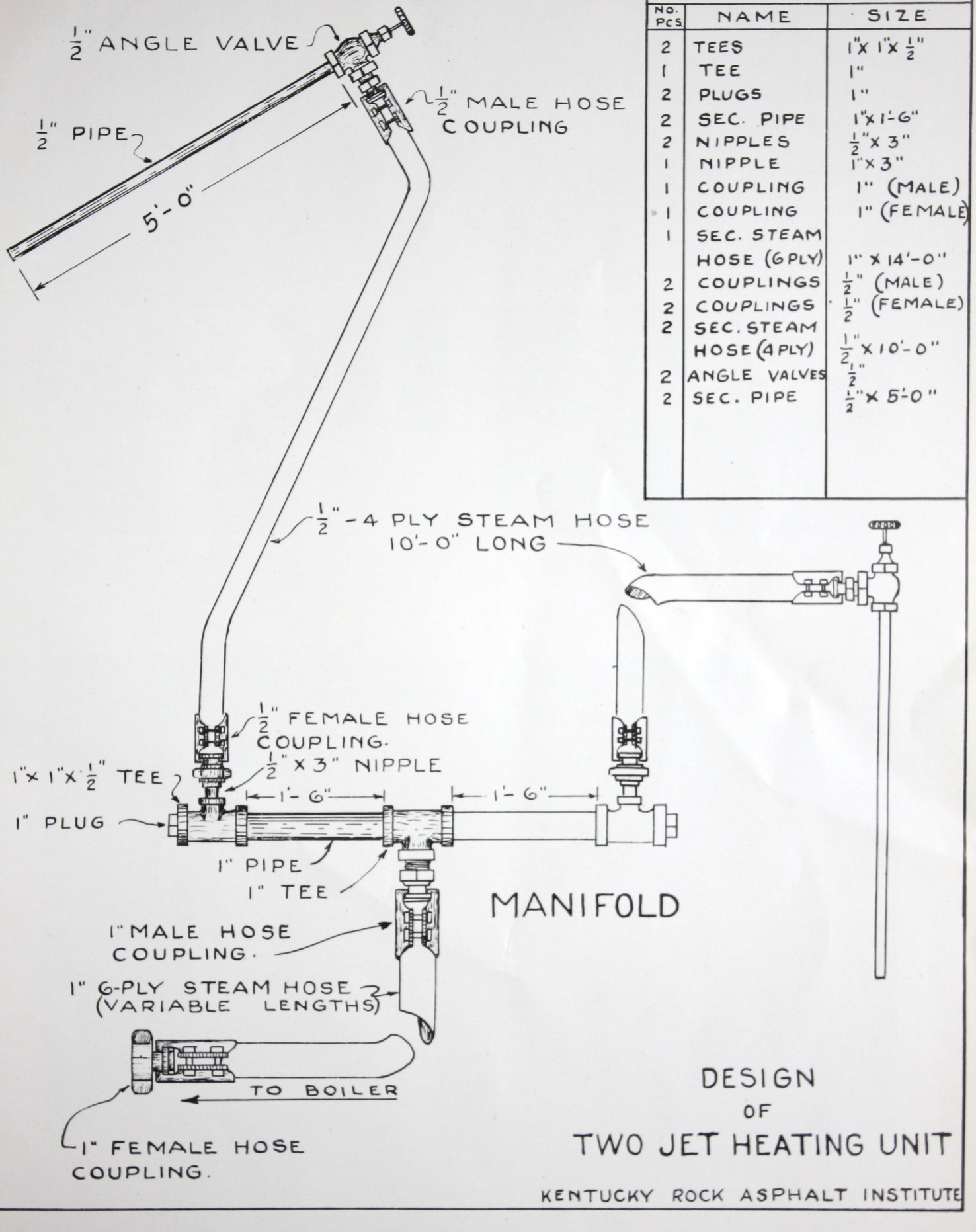
USED IN

LAYING KENTUCKY ROCK ASPHALT

KENTUCKY ROCK ASPHALT INSTITUTE
LOUISVILLE, KENTUCKY.

DRAWN BY _____
APPROVED BY _____
DATE 3/18/37

NOT DRAWN TO SCALE.



BILL OF MATERIAL

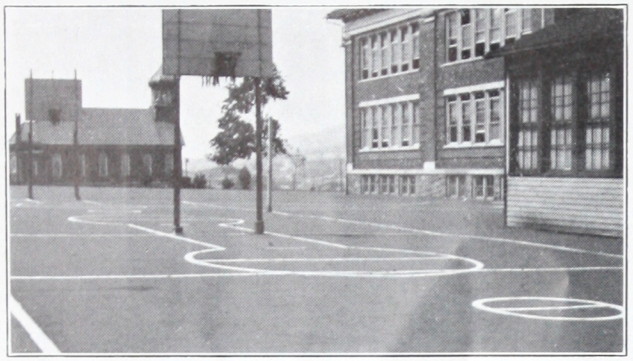
NO. PCS	NAME	SIZE
2	TEES	1"x1"x½"
1	TEE	1"
2	PLUGS	1"
2	SEC. PIPE	1"x1'-6"
2	NIPPLES	½"x3"
1	NIPPLE	1"x3"
1	COUPLING	1" (MALE)
1	COUPLING	1" (FEMALE)
1	SEC. STEAM HOSE (6PLY)	1" x 14'-0"
2	COUPLINGS	½" (MALE)
2	COUPLINGS	½" (FEMALE)
2	SEC. STEAM HOSE (4PLY)	½"x10'-0"
2	ANGLE VALVES	½"
2	SEC. PIPE	½"x5'-0"

DESIGN OF TWO JET HEATING UNIT

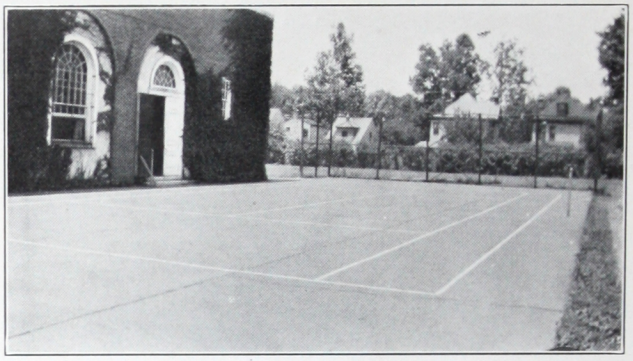
KENTUCKY ROCK ASPHALT INSTITUTE

ESTIMATED QUANTITIES OF MATERIALS

Material		Lbs. per sq. yd. of Compacted Material 1″ Depth
Kentucky Rock Asphalt		100
Binder Course Material (Stone coated with bitumen)		100
Waterbound Limestone Macadam Base with 30% screenings		110 to 120
Bituminous (Penetration) Macadam	stone	92 to 100
	bitumen	5 to 10
Fine aggregate	crusher-run limestone	110 to 120
	bank-run gravel	115 to 125



Combination playground in Schoolyard at Palmerton, Pa. Kentucky Rock Asphalt Surface on Zinc Smelter Slag Base. Laid 1927.

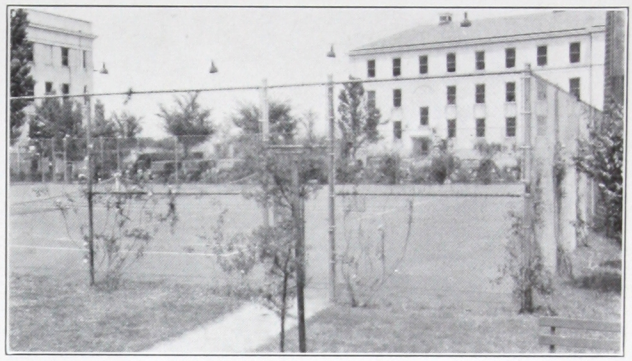


Combination playground at Collegiate School, Louisville, Ky., which serves for Tennis, Basketball and other games. Kentucky Rock Asphalt surface on Cement Concrete Base. Laid 1929.

Walk in Stockley Gardens, Norfolk, Va. Surfaced with Kentucky Rock Asphalt in 1936.

KENTUCKY ROCK ASPHALT PLAYGROUNDS

Kentucky Rock Asphalt Playground in the yard of the Story School, Milwaukee, Wis.



Kentucky Rock Asphalt Tennis Court on the grounds of the Marine Public Service Hospital, Norfolk, Va. Laid 1936.

Main Avenue of the Chicago "Century of Progress Exposition" (1933-1934) called the "Avenue of Flags". It was surfaced with Kentucky Rock Asphalt and carried most satisfactorily a pedestrian traffic rarely exceeded anywhere after the pavement had carried an enormously heavy vehicular traffic for several years. The resilient, non-skid surface, totally free from any glare, made it most appropriate for this World's Fair Promenade.

KENTUCKY ROCK ASPHALT

The Ideal Tennis Court Surface

A Battery of Tennis Courts in Central Park, New York City. Surfaced with Kentucky Rock Asphalt.

KENTUCKY ROCK ASPHALT INSTITUTE
LOUISVILLE, KENTUCKY